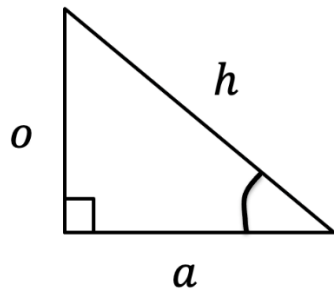
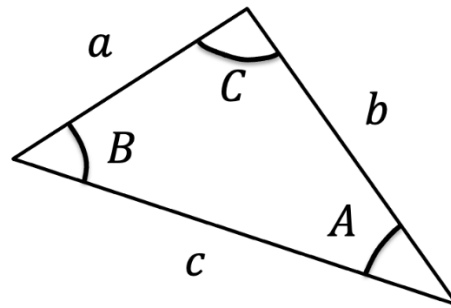


Right-Angled Triangles:

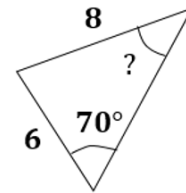


Non-Right-Angled Triangles:



We label the sides  $a, b, c$  and their corresponding OPPOSITE angles  $A, B, C$

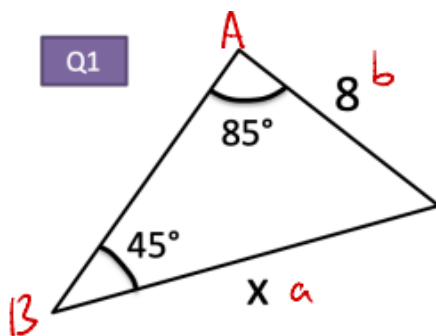
You have	You want	Use
#1: Two angle-side opposite pairs	Missing angle or side in one pair	Sine rule



Sine Rule:

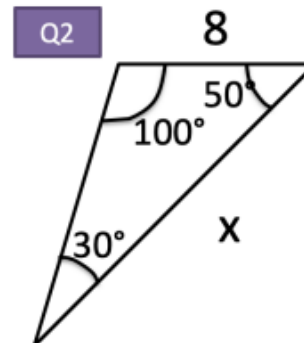
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Examples



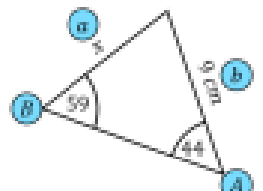
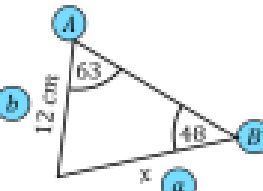
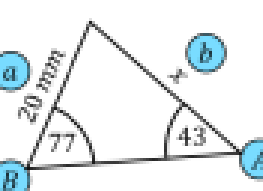
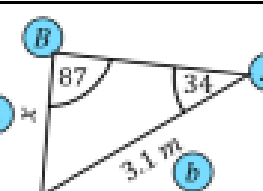
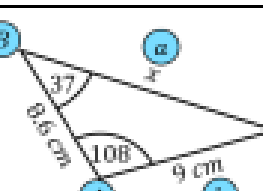
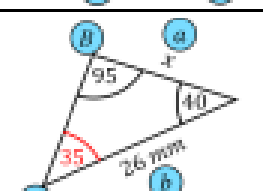
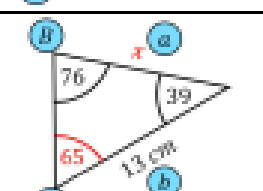
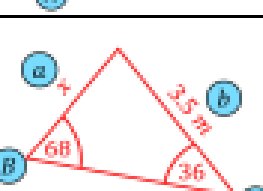
$$\frac{x}{\sin 85} = \frac{8}{\sin 45}$$

$$x = 11.27$$

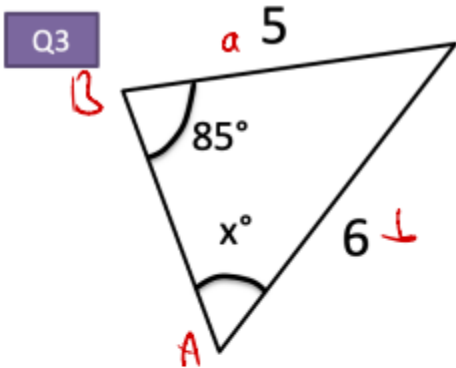


$$\frac{x}{\sin 100} = \frac{8}{\sin 30}$$

$$x = 15.76$$

Labelled diagram	Substitute into formula	Rearrange formula	Length (1dp)
	$\frac{x}{\sin 44} = \frac{9}{\sin 59}$	$x = \frac{9 \times \sin 44}{\sin 59}$	$x = 7.3 \text{ cm}$
	$\frac{x}{\sin 63} = \frac{12}{\sin 48}$	$x = \frac{12 \times \sin 63}{\sin 48}$	$x = 14.4 \text{ cm}$
	$\frac{20}{\sin 43} = \frac{x}{\sin 77}$	$x = \frac{20 \times \sin 77}{\sin 43}$	$x = 28.6 \text{ mm}$
	$\frac{x}{\sin 34} = \frac{3.1}{\sin 87}$	$x = \frac{3.1 \times \sin 34}{\sin 87}$	$x = 1.7 \text{ m}$
	$\frac{x}{\sin 108} = \frac{9}{\sin 37}$	$x = \frac{9 \times \sin 108}{\sin 37}$	$x = 14.2 \text{ cm}$
	$\frac{x}{\sin 35} = \frac{26}{\sin 95}$	$x = \frac{26 \times \sin 35}{\sin 95}$	$x = 15.0 \text{ mm}$
	$\frac{x}{\sin 65} = \frac{13}{\sin 76}$	$x = \frac{13 \times \sin 65}{\sin 76}$	$x = 12.1 \text{ cm}$
	$\frac{x}{\sin 36} = \frac{3.5}{\sin 68}$	$x = \frac{3.5 \times \sin 36}{\sin 68}$	$x = 2.2 \text{ m}$

## Examples 2

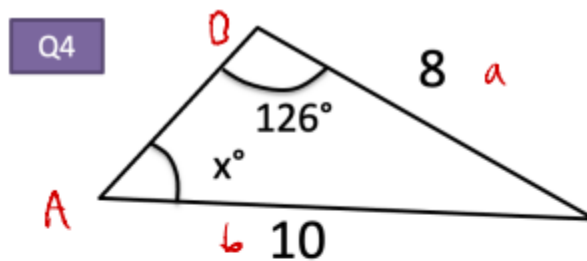


FLIP FORMULA

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin x}{5} = \frac{\sin 85}{6}$$

$$x = 56.11^\circ$$



$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin x}{8} = \frac{\sin 126}{10}$$

$$x = 40.33^\circ$$

Test your understanding

Find the missing angle.

(a)

Triangle with side  $4.8 \text{ cm}$ , side  $6.2 \text{ cm}$ , angle  $43^\circ$ , and angle  $d$ .

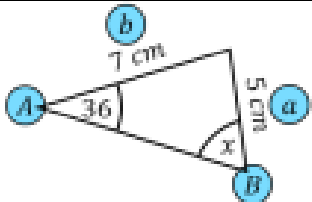
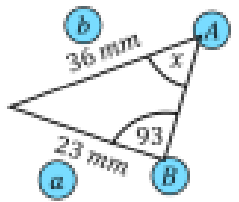
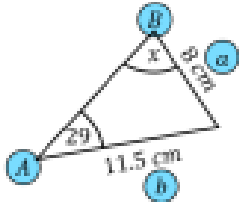
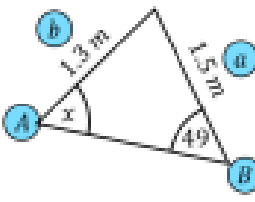
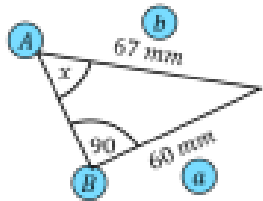
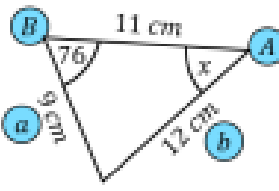
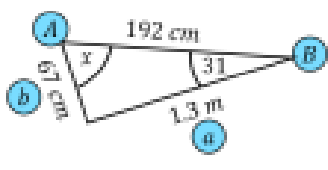
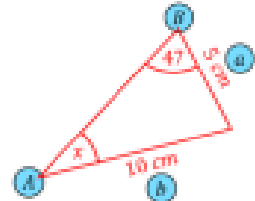
(b)

Triangle with side  $8 \text{ cm}$ , side  $5 \text{ cm}$ , angle  $61^\circ$ , and angle  $e$ .

(c)

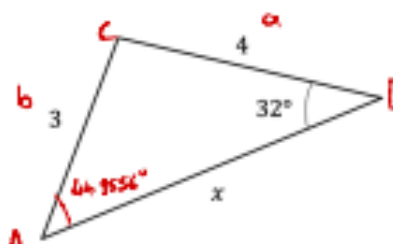
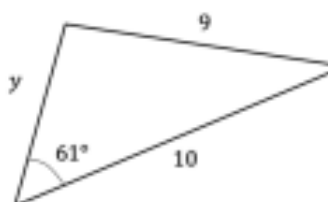

Triangle with side  $9.1 \text{ cm}$ , side  $7.9 \text{ cm}$ , angle  $67^\circ$ , and angle  $f$ .

(a)  $61.8^\circ$   
 (b)  $33.1^\circ$   
 (c)  $53.0^\circ$   
 (d)  $25.7^\circ$   
 (e)  $46.0^\circ$


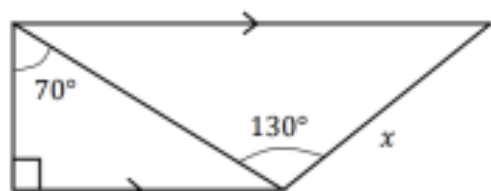
Labelled diagram	Substitute into formula	Rearrange formula	Acute Angle (1dp)
	$\frac{\sin 36}{5} = \frac{\sin x}{7}$	$\sin x = \frac{7 \times \sin 36}{5}$	$x = 55.4^\circ$
	$\frac{\sin x}{23} = \frac{\sin 93}{36}$	$\sin x = \frac{23 \times \sin 93}{36}$	$x = 39.6^\circ$
	$\frac{\sin 29}{8} = \frac{\sin x}{11.5}$	$\sin x = \frac{11.5 \times \sin 29}{8}$	$x = 44.2^\circ$
	$\frac{\sin x}{1.5} = \frac{\sin 49}{1.3}$	$\sin x = \frac{1.5 \times \sin 49}{1.3}$	$x = 60.6^\circ$
	$\frac{\sin x}{60} = \frac{\sin 90}{67}$	$\sin x = \frac{60 \times \sin 90}{67}$	$x = 63.6^\circ$
	$\frac{\sin x}{9} = \frac{\sin 76}{12}$	$\sin x = \frac{9 \times \sin 76}{12}$	$x = 46.7^\circ$
	$\frac{\sin x}{130} = \frac{\sin 31}{67}$	$\sin x = \frac{130 \times \sin 31}{67}$	$x = 87.9^\circ$
	$\frac{\sin x}{5} = \frac{\sin 47}{10}$	$\sin x = \frac{5 \times \sin 47}{10}$	$x = 21.4^\circ$

USE SINE RULE TWICE !!!

### Extension

 <p> <math>\sin A = \frac{4 \sin 32}{3}</math>    <math>A = 44.9556^\circ</math>  <math>\therefore C = 180 - 32 - 44.9556 = 103.0444^\circ</math>  <math>\frac{x}{\sin 103.0444} = \frac{3}{\sin 32}</math>  <math>x = 5.52 \text{ (3sf)}</math> </p>	 <p><math>y = 6.47</math></p>	 <p><math>y = 5.01</math></p>
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### Problem Solving

<p><b>10</b></p>  <p>Determine the angle <math>\theta</math>, giving your answer to 3 significant figures.</p> <p><math>\theta = 64.2^\circ</math></p>	 <p>Determine the length of <math>x</math>, giving your length correct to 3 significant figures.</p> <p><math>x = 16</math></p>
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